

## Education and Outreach Considerations

### SEATTLE POST-INTELLIGENCER

[http://seattlepi.nwsourc.com/local/19521\\_quake20.shtml](http://seattlepi.nwsourc.com/local/19521_quake20.shtml)

### Deep beneath Seattle, a 6.7 'silent quake' nobody felt Global Positioning System 'blip' leads scientists to discovery

Friday, April 20, 2001

By TOM PAULSON

SEATTLE POST-INTELLIGENCER REPORTER

SAN FRANCISCO -- In August 1999, a 6.7-magnitude "silent earthquake" started deep beneath Seattle and moved north into Vancouver Island over the next 35 days.

"It was equivalent in energy to the Nisqually quake," said Herb Dragert, a scientist with the Geological Survey of Canada in Sidney, B.C.

Lori Dengler  
Humboldt State University

December 30, 1994

**FRIDAY**

Chance of rain  
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Humboldt had an eventful year/Arts & Leisure

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**Times-Standard**

FRIDAY  
Dec. 30, 1994  
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(plus for delivery)

**State studies effects of titanic quake**  
Springtime report considered as planning aid in catastrophe

By Kelly Johnson  
The Times-Standard

SUNSET — The state is going to help the North Coast prepare for the Big One.

The state Division of Mines and Geology is studying what could happen if an 8.5-magnitude tremor — one larger than the 1906 San Francisco quake — hit offshore. A report will be issued in March.

"The report is intended to provide a worst-case scenario to enable emergency response officers to prepare appropriate emergency plans," said Henry Boser, state Department of Conservation public affairs manager.

Boser officials are not preparing the report because they think a huge quake is going to hit the North Coast, Boser said from Sacramento. They just want the area to be prepared if it does.

Boser said the hypothesis is that an 8.5 tremor ruptures the Gorda plate — the one that moved in Monday's 5.3-magnitude tremble — and creates a tsunami.

The report, which deals with the three days after the catastrophic quake, will estimate the number of so-called "victims" that would be out of service.

Utilities include electricity, water and natural gas supplies, airports, railroads, highways, hospitals and communication systems.

The report will not make assumptions about which local buildings will fail, she said. Instead, it will talk about types of structures that would be unsafe. It also will discuss the possibility of quake-related disasters such as landslides and ruptures in the ground.

In addition, the document will include maps of the fault area and the earthquake history of both counties.

"We state workers looked with the project have traveled to the North Coast several times for research. They also have worked with Humboldt State University geology Professors Lori Dengler and Gary Carver.

"It's a very thorough process to capture all the information that would be of help to the local emergency response officials," Boser said.

The state Office of Emergency Services, which is paying for the research project, will distribute the report to local agencies that deal with emergencies.

Linda Rediet, local Office of Emergency Services coordinator, said the report will be "a lot of help."

"It gives us a good basis for planning. We have needed some sort of forecast for ages," she said.

The document will help officials learn what they are doing right and what they will need to do. Based on the information, existing emergency-preparedness programs will be expanded and new ones will be developed. Boser said the report also will help people from all agencies realize the importance of working together to get ready for the next big earthquake.

"We're very excited it's being done," she said.

The Division of Mines and Geology has prepared similar reports for the Sacramento-San Joaquin, San Andreas fault regions of Northern and Southern California, portions of the city of Los Angeles and Orange County, Alameda County and San Diego County.

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March 16, 1995

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**Increasing clouds**  
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Mandy Hubbard strikes out 14 in 8-1 win **B1**



**Fear of tiny organism could spur costly Humboldt water project/A3**

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# Times-Standard

THURSDAY  
March 16, 1995  
42nd Year, No. 73

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## 8.4 quake endangers property, not lives

**By David Anderson**  
The Times-Standard

Property destruction will be enormous if a giant earthquake ruptures the Cascadia subduction zone sometime in the next 200 years. Human casualties may not be.

The tsunami seen in Kobe, Japan, and other major earthquakes, including victims trapped in the rubble of collapsed apartment houses, will largely be avoided here. The North Coast has few high-rise buildings or structures of untested ma-



**The Big One**

Last of three parts

material the effects of a quake magnitude 8.4 or greater, most North Coast residents are out or two stories high and built of wood. If they are firmly attached to their foundations, they will suffer little structural damage.

Even if such a building is shaken off its foundation, only minor injury is likely to result to occupants.

Some people could be killed or badly hurt if they are caught on collapsing bridges and overpasses, or in older office buildings. And residents of the Samoa

**BE PREPARED:** Steps to take before, during big quake **A6**

peninsula will be in very great danger from the tsunami, which will follow the earthquake.

"Our scenario deliberately doesn't include casualty estimates," said Pamela Morris, spokeswoman for the Department of Conservation. "It depends on too many factors, such as what time of day it hits. The best thing is to assume they're high and prepare accordingly."

In reality, the great majority of those present when the giant earthquake hits will survive it, most of them with minor or no injuries. But they will find themselves without water, gas, electricity or telephone service for at least three days, and with major roads impassable for much longer.

Whether they also end up homeless and sleeping on the floor of an evacuation center may depend on what precautions they take before the quake.

■ See QUAKES

March 16, 1995

**'Big One' would wreak havoc**

**By Michael Corbett**  
For The Union

About 15 minutes after the Gorda Plate interface rips along its 150-mile length offshore, a wall of water approximately 30 feet high will wash over the Samoa Peninsula, across the harbor, and flood surrounding waterfronts in one to two feet of water.

The 2,000 to 3,000 residents of Manila, Fairhaven and Samoa will have only one clear warning of the impending tidal wave — the severe and prolonged ground shaking of one minute or more that characterizes a great subduction zone earthquake.

With road access to both Eureka and Arcata cut off by ground movement, emergency planning officials are hard pressed to propose any solution to such a problem — one of the many recognized now as part of a likely scenario in the future of Humboldt County.

"This is not science fiction, it is reality," said state geologist James Davis during an earthquake scenario presentation last week in the Humboldt County Board of



**James Davis**  
tion zone quake on the Cascadia fault.

The giant quakes are so rare that, except for a multitude of American Indian legends, none has ever occurred in the 150 years of written history on the North Coast.

Research at Humboldt State University by Professor Gary Carver indicates that five such giant

fessor of geophysics at Humboldt State University.

"The unreinforced masonry buildings, I think, are something that we cannot live with. Those are the kinds of buildings that kill people," she said.

But, she said, "The vision of absolutely everything going flat to the ground is not the case," she said.

Tousan Topozada of the Department of Conservation, Division of Mines and Geology said one severe problem would be hospital space.

"There are 348 hospital beds locally, but one third of those won't be available. So, with so few resources, outside help will be critical," he said.

The rural location of much of the population presents another difficulty.

"One of the problems is that highways will be closed and if you have casualties in some of the outlying communities, about the only way they're going to get to a facility is by air. So the smaller airports become extremely important," Topozada said.

Highway 101 north and south

March 17, 1995

## OPINIONS

A4

The Daily Forum for the North Coast Community

Friday, March 17, 1995

### A Times-Standard editorial

## Now's the time to prepare for the cataclysm next time

**T**his week's report on how "The Big One" would devastate the North Coast seems at first bluish, just another tough-love exercise that officials might use to scare citizens into taking care of themselves.

It is not. Instead, it is a rare, ruthless look at how an 8.4-intensity earthquake would quickly unravel the systems that keep our communities civilized.

The state report says that such a tremor would wipe out roads, flood whole communities, collapse buildings and bridges and cut power and water. Worst of all, residents would be on their own for an undetermined length of time.

Social services such as food delivery and the security net provided by hospitals, police and fire units and other emergency-services personnel would be missing for many residents.

On a personal level, that would mean a reshuffling of priorities. All efforts would be directed to gathering food, water, medical care and shelter for oneself and one's family.



Epilogue

The report offered to North Coast emergency planners by the state Division of Mines and Geology and the Office of Emergency Services is one of the most comprehensive tomes on the subject ever reported. For that, residents can be grateful for time and money well spent.

Its true value, however, lies in whether its message is taken to heart, whether it changes anyone's habits from fearing the cataclysm next time to actually preparing for it.

One group is ahead of the game. Humboldt County's Office of Emergency Services and members of the Red Cross are hard at work forming volunteer teams to help their own neighborhoods in a crisis.

The Neighborhood Emergency Service Team, or NEST, project features a leadership structure and a plan of action for the aftermath of a major disaster. It includes membership meetings, training in first aid and emergency response, oversight for injured people, senior citizens and children, even cleanup after an upheaval, to clear access roads.

The OES and Red Cross have formed about 300 such groups in the past six months. Though they are in their infant stages, these clusters hold much promise, perhaps even the key to survival. For when calamity comes, it will be such grass-roots activity that will save the day. ■

March 15, 1995

right to the road. tion projects was made on Tuesday approved a re- 1,000 feet south of Alister Avenue. Norte County, and numerous Humboldt County officials.

## Earthquake

Both city and county officials believe state did a shoddy job during disaster study

By Mike McKenzie-Bahr  
Tribune staff writer

Portions of a state study regarding local vulnerability to earthquakes is flawed, local officials say.

And the Board of Supervisors are so bothered by what it feels was the unprofessional handling of the report a letter of complaint is being sent to Gov. Pete Wilson.

Del Norte County and Crescent City representatives said they plan to use the information in the study, which was presented by state officials Monday in Eureka, to prepare for a damaging earthquake and an accompanying tsunami.

But they are upset the meeting was the first time they saw the report, even though it had been worked on at the state level for three years at a cost of approximately \$300,000.

Supervisor Clyde Eller, County Administrative Officer Ron Holden and Commu-

### What the supervisors did

In other action, the Supervisors:

- Adopted a policy of allowing the county waste collection franchise, now contracted to Del Norte Disposal, to run out and to put the franchise out to bid. The vote is not binding on the Del Norte Solid Waste Management Authority, which will ultimately make that decision.
- Passed an ordinance

allowing the use of vehicles to gather firewood on South Beach with a \$10 permit from March 15 to March 31 and in November, December and January.

• Voted to hold an infrastructure workshop on March 23 at 8:30 a.m.

• Accepted the resignation of Supervisor Jack Reese from the Intergovernmental Relations Committee and appointed Supervisor Barbara Clausen to take his place.

• Approved the transfer of \$22,000 for legal and mediation services for the Superior site. The money came from a funds set aside for the closure of the landfill. The supervisors said they will replace the money.

• Adopting a \$3 fee for jail inmate-initiated medical visits.

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Del Norte County Board of Supervisors, pointed out several other problems.

"The good news is that McNamara Field would remain pretty much intact," Perry said. "The report states the runways are long enough to land C-130s. But our runways aren't built for planes that size. The first five or six would be fine, but the rest would tear the hell out of it."

He also expressed concerns about the maps used in the study.

"They show roads that don't exist," he said. "They have a responsibility to provide accurate maps."

Perry said regardless of the those problems, a quake of that magnitude would create "quite a lot of devastation through a large area."

"We would not be high on the list of the state's priorities," he said. "We need to be able to take care of ourselves for a period of time."



March 25, 1995

March 25, 1995

Mostly sunny  
Details back of Section

Oklahoma State  
stuns No. 1 Wake  
Unless Arkansas, Virginia advance to Elite Eight

Humboldt man charged with hate  
crime ordered to stand trial/A3  
Arcata pastor alarmed by trend  
toward 'vilifying' the poor/A7

**Times-Standard**  
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**Area dunes could be a tsunami refuge**  
By David Anderson  
The Times-Standard

MANILA — High dunes may provide refuge to any who can reach them before a tsunami hits.

But those who live in the dunes should be prepared to spend the night, Manila residents were told at a recent meeting.

Geologists and army officials addressed a capacity crowd at the Manila Community Center on the likely results of a major earthquake at the Cavendish earthquake zone.

Humboldt State University Professor Gary Carver estimated the likelihood of such a quake at about a one-in-three probability within 50 years.

While the quake will do considerable damage, Professor Lee Dwyer said, there are likely to be relatively few casualties from the shaking. Humboldt County's largest area of concern is the Manila Peninsula, where 2,000 people could be trapped with all escape routes blocked.

The two geologists could offer the extent of threat, of which the likelihood is the possibility that the quake report. On the other hand, Carver warned, it could also be larger.

The state report postulates a quake involving only the southern end of the zone, and causing a tsunami about 33 feet high. Carver noted that it would probably be lower in many places with "spills" of more higher water in others.

A 33-foot tsunami would leave higher dunes untouched, he said, but the first wave may arrive within 15 minutes.

Tsunami waves come in series, he said, with the first one seldom the largest. It could be many turns before it is safe to come down.

While the force of the waves will be broken by the dunes and vegetation, he said, enough water will run through low places to damage buildings on the landward side of the dunes. Rooftops will not be a safe refuge.

"Wooden buildings, without earthquakes, but don't do well to tsunamis," he said. "You might be better off on the roof than in your yard, but not much."

from Fairhaven. A tsunami comes in with the force of a river in flood, he added, and often chokes with debris. Small boats would have little chance in such a situation, although large ships at the Louisiana-Pacific Corp. docks might provide a refuge for some.

"Perhaps they should consider moving the Highway on this side of the bay," he suggested.

Debra Nollan, emergency services coordinator for the county, said help would be sent as soon as possible, but noted that roads and utilities will probably be broken and all communications badly disrupted. Those who are prepared to take care of themselves are most likely to survive.

Residents were urged to learn the shortest route to the nearest high dune, and have a pack of emergency supplies ready to grab as they leave.

John Wadley, chairman of the Manila Community Services District, said the district will try to identify high dune areas that could serve as emergency refuges, and will contact landowners to make sure they are accessible. Residents

**High ground**

Areas above 30 feet  
20-30 feet above sea level  
Less than 20 feet above sea level

Pacific Ocean  
Arcata Bay  
Manila  
Victor Blvd

## Education Efforts

- Print material
- PSAs
- Redwood Coast Tsunami Work Group
- EQ – Tsunami Room at County Fairs
- Tsunami Curriculum & teacher workshops
- Community talks and workshops
- Relative tsunami hazard maps

**living on shaky ground**

Earthquake said, "Well, I shall tear up the earth." Thunder said, "That's why I see we will be companions, because I shall go over the whole world and scare them . . ." So he (Thunder) began to run, and leaped on trees and broke them down. Earthquake stayed still to listen to his running. Then he said to him, "Now you listen: I shall begin to run." He shook the ground. He tore it and broke it to pieces. . . All the trees shook; some fell. . .

Now . . . the reason Earthquake goes to different places (to) because in the beginning he did that, and did not encompass the world in one day. It is thus with him now. He cannot go entirely around in a day, so he goes part way, and as it were spreads the night. In some places he shakes the earth hard, in some he shakes it a little. For he did that in the beginning and does it now.

Yurok legend told by Toker of Espes, recorded by A.L. Kroeber

**HOW TO SURVIVE EARTHQUAKES & TSUNAMIS ON THE NORTH COAST**

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# planning for the "big one":

APRIL 26, 1992

**GROUND FAILURE** due to lateral spreading during 1992. Photo by Chris Henshaw.

**LIQUIDATION**  
When loosely packed, wet sand is shaken during an earthquake, it may flow like a liquid. Anyone who has walked along the beach has probably seen a small-scale version of this process. Running near shore in the sand near the water's edge and suddenly the area of your feet prior to the waves like sticky gelatin.

When a soil liquefies, it is unable to support the weight of any structure above it. Bridges and buildings may lose their footing even though they may have been designed to withstand strong ground shaking. If the liquefaction area is as a slugs, massive landslides may result.

**FICTION: SMALL EARTHQUAKES PREVENT BIG ONES FROM HAPPENING.**  
Not true. Earthquakes are nature's way of releasing energy. Each magnitude level represents about 30 times more energy released. It takes 30 magnitude 3 earthquakes to release the energy of a magnitude 4 earthquake. 900 magnitude 3's to equal a magnitude 5. 27,000 magnitude 3's to equal a 6 and so forth. This requires 10,000 magnitude 3 earthquakes every year for 300 years to release the energy of a single magnitude 6!

**About Earthquake Planning Scenarios**  
Earthquake planning scenarios model the expected strength of shaking, distribution of liquefaction and landslide hazards, and damage to roads and utilities caused by a particular earthquake. They assist in planning emergency response and in reducing hazards before the earthquake occurs. The damage assessments are general in nature and are not intended as site-specific evaluations. Seven previous scenarios for earthquakes in metropolitan areas within the San Francisco Bay Area and southern California have been published by the Division of Mines and Geology since 1982. The subduction zone planning scenario differs from previous scenarios in several important ways:

- It is the largest magnitude earthquake (8.4) to be modeled.
- It is the first scenario focused on a predominantly rural area.
- It is the first scenario to model an earthquake on a thrust fault.
- It is the first scenario to include the effects of a tsunami.

**The Scenario Earthquake**  
A magnitude 8.4 earthquake ruptures a 150-mile-long, 50-mile-wide segment of the megathrust, extending from Cape Mendocino to just north of the Oregon border. The fault plane dips at an angle of 11° to the east beneath the coast. The postulated fault surface is about six miles beneath Petrolia, nine miles beneath Eureka and twelve miles beneath Crescent City. The scenario assumes concurrent movement and surface rupture along the little Salton fault. Potentially damaging ground shaking continues for about a minute, and aftershocks occur for several months, including a few in the magnitude 6 to 7 range. Expected shaking is generally greatest near the coast, with Eureka, Arcata, Fortuna and Crescent City likely to experience shaking similar to that expected by Northridge residents in January 1994. The earthquake damages highways and utilities, restricting the arrival of emergency supplies for 2 weeks.

**The Scenario Tsunami**  
The earthquake will cause the surface of the sea floor to deform, producing a series of waves which will begin arriving within minutes of the earthquake. Expected wave heights were modeled for the Humboldt Bay and Crescent City areas only. The scenario tsunami is expected to inundate much of the Seward Peninsula and, to a lesser extent, the community of King Salmon which faces the opening of Humboldt Bay. The peninsula faces the brunt of the waves, minimizing flooding in Eureka. The highest dunes along the Seward Peninsula may offer refuge from flooding. Tsunami destruction of Crescent City exceeds that from the 1964 tsunami generated by the great Alaskan earthquake. The period of potentially dangerous wave activity is expected to last many hours.

**Why was this scenario earthquake chosen?**  
An earthquake like the scenario earthquake has not occurred during the approximately 150 years of written history on the North Coast. There is, however, a growing body of scientific evidence that shows earthquakes of this magnitude or larger occurred as recently as 300 years ago and recur on intervals of several hundreds of years. The 1992 Cape Mendocino earthquake near Petrolia demonstrated that the Cascadia subduction zone is both capable of producing large earthquakes and generating tsunamis. Although the planning area is lightly populated, the very large area affected by the earthquake and the potential for a destructive tsunami justified the preparation of the planning scenario. The scenario earthquake may not be the largest event which could occur along the megathrust. However, it is likely to produce within Humboldt and Del Norte Counties about as much damage as a rupture of the entire subduction zone.

**Does the scenario say when this earthquake will happen?**  
No. The planning scenario discusses the likely effects of such an earthquake. It does not predict when the earthquake will happen or discuss the likelihood of such an event. However, the earthquake is considered sufficiently credible to justify planning in advance.

**Where can copies of the scenario be obtained?**  
The planning scenario is a public document and is available in many local libraries and public agencies. Copies can be purchased from the California Division of Mines and Geology (See page 20). If you have questions about the scenario or its expected effects in your area, contact your local Office of Emergency Services.

**Distribution of scenario earthquake and tsunami effects, Humboldt Bay area. 1994 showing shown on scale of emergent ground shaking. Blue line is the expected extent of tsunami flooding. Figure from CDMG.**

**Map showing the extent of Crescent City flooding (shaded green) from the 1964 Alaskan earthquake tsunami. The predicted extent of flooding from the scenario tsunami is shown by the blue line. Figure from 19 in CDMG and CDMG.**

**ON MARCH 28, 1964 Crescent City was damaged by a tsunami originating from the Great Alaskan earthquake. Note how white buildings were lifted and moved by the force of the water. An aerial view looking north. (Del Norte County Historical Society Photograph)**





